INTERGENERATIONAL KNOWLEDGE TRANSFER IN THE ACADEMIC ENVIRONMENT OF KNOWLEDGE-BASED ECONOMY

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Abstract
In the immediate future, intergenerational knowledge transfer is one of the knowledge-based economy's main challenges since an inner motivational force powers knowledge transfer. Knowledge transfer from individuals to groups and organization must follow knowledge creation in order to transform individual into organizational knowledge, along the epistemological dimension of the Nonaka's knowledge dynamics model. Moreover, the knowledge intensive organizations increase their fluxes of knowledge across different age layers and different departments, reducing in the same time the company knowledge loss.
The academic environment is, by nature, an age layered field or a nested functional structure. Intergenerational knowledge transfer becomes any university main driving force, while understanding its dynamics is important for academic life improvement. The purpose of the paper is to present some of our research results in the field of intergenerational knowledge transfer in the academic environment of the knowledge-based economy. We performed a qualitative and quantitative research of the knowledge transfer process in the academic environment, using the Analytic Hierarchy Processes (AHP). We analyzed the faculty staff attitudes toward cooperation, competition, and innovation as main priorities in performing research, writing books and publishing scientific papers. The above-mentioned activities are based on intergenerational knowledge transfer and lead to learning processes at individual and organizational levels. Respondents are members of the academic staff of economics and business faculties from the main Romanian universities.

Keywords: knowledge, knowledge-based economy, knowledge transfer, university

JEL Classification: C44, D81, D83, I23

Introduction

According to OECD glossary, *the knowledge-based economy* is an expression coined to describe trends in advanced economies towards greater dependence on knowledge, high skill levels, and the increasing need for easy access to all of these by the business and

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public organizations. Knowledge became in the last decades the driving force of economic growth and thus it is an important variable in the new theories and models concerning economic development. "*Although knowledge has long been an important factor in economic growth, economists are now exploring ways to incorporate more directly knowledge and technology in driving productivity and economic growth. In this view, investments in research and development, education and training and new managerial work structures are key*" (OECD, 2011, p.7).

Classical economic theories and models contain variables derived from the tangible environment, focusing on labor, capital, materials, and energy. Knowledge has been considered as only an external factor able to influence the *production functions*. Nowadays, knowledge must be incorporated, as a key factor, into these functions. However, this is not an easy task due to its intangible nature. Investments in knowledge will lead to higher productivity and efficiency although the correlations are linear, since knowledge processing is by nature highly nonlinear. One of the main barriers in understanding the intellectual capital is exactly this nonlinearity of its intangible components, i.e. knowledge, intelligence, and values (Allee, 1997; Andriesen, 2004; Bratianu, 2008; Bratianu, 2009).

Tangible resources are by nature finite and even scarce. Intangible resources tend to be abundant. What is scarce in this new economy is the capacity of processing them, and for organizations to learn. In this new context of the knowledge-based economy, distinctions can be made among various types of knowledge: know-what, know-why, know-how, and know-who. *Know-what* refers to knowledge about facts and events. It is the knowledge used mostly in medicine and law, or by experts in other fields of activities. *Know-why* refers to scientific knowledge expressed usually as principles and law of nature. This is the knowledge used in designing and developing technologies and industrial processes for manufacturing products. *Know-how* refers to skills or capability to do something. Managerial decision-making is based on this type of knowledge. Know-how is an important factor in getting competitive advantage and therefore is kept within the firms boundaries. *Know-who* refers to who knows what and who knows how to do what. It involves the development of special social relationship, which makes it possible to get access to experts and use their knowledge efficiently. Compared to the other types of knowledge, the latter resides mostly inside each organization. Know-what and know-why represent explicit knowledge and can be obtained reading books, attending lectures, accessing databases and other knowledge resources. Know-how reflects the tacit knowledge and is related to the direct experience one may have in a certain domain. It will be typically learned in apprenticeship contexts. Know-who is obtained in the social practice, or some special educational environments (Hawryszkiewycz, 2010; Geisler and Wickramasinghe, 2009).

According to OECD studies, "*In the knowledge-based economy, the science system must balance not only its roles of knowledge production (research) and knowledge transmission (education and training) but also the third function of transferring knowledge to economic and social actors, especially enterprises, whose role is to exploit such knowledge*" (OECD, 2011, p.25). Thus, knowledge transfer is an essential process in the knowledge-based economy, a process that has a different nature than the transfer of tangible objects. Knowledge transfer involves at least two individuals and a specific context called by Nonaka and Takeuchi *Ba* (Nonaka and Takeuchi, 1995). *Ba* is simultaneously a physical and a non-physical space where social interchange can take place generating and transferring knowledge. "*The essence of Ba is the context and the meanings that are shared*

and created through interactions which occur at a specific time and in a specific space, rather than a space itself. Ba also means relationships of those who are at the specific time and the specific space" (Nonaka and Toyama, 2007, p.23).

Experts consider that a knowledge-based economy can be developed on a four pillars framework, and a full sequence of actions: incentives, reforms, investments, implementations, and project management (The World Bank Institute, 2011b). The first pillar is *economic and institutional regime* that must provide incentives for the effective use of current knowledge, acquisition of new knowledge, knowledge creation, knowledge transfer, and dissemination, and their application to economic processes in order to improve productivity, enhance quality, innovate, and launch new businesses. The second pillar is *education and skills* that enables knowledge creation, share, and correct use. Education is one of the most important integrators in the development of organizations' human capital (Bratianu, Jianu and Vasilache, 2011). The third pillar is information and communication infrastructure facilitating the efficient communication, dissemination, and information processing. The fourth pillar is *innovation system*, which increases the knowledge stocks and flows, and uses them correctly for new products and services design and development.

Based on these pillars, the World Bank Institute designed a Knowledge Assessment Methodology (KAM) that supports countries in identifying opportunities for the transition toward the new knowledge-based economy. This methodology is based on 12 basic indicators, i.e. three indicators for each pillar, containing a whole spectrum of 83 variables, normalized on a scale from 0 (weakest) to 10 (strongest). This evaluation set of variables can report the relative performance of analyzed countries on the knowledge-based economy. The 12 basic indicators are shown in Table no. 1. KAM contains the following components: KEI – Knowledge Economy Index; KI – Knowledge Index; EIR – Economic Incentive Regime; Innovation, Education and ICT – Information and Communication technology. Although education is a stand-alone component it is involved implicitly in all the other components. Education is also the main change driver in any economic crisis (Albu and Dinu, 2009).

Table no. 1: The 12 basic indicators used in KAM

Pillar	**Basic indicators**
Economic and institutional regime	• Tariff and non-tariff barriers • Regulatory quality • Rule of law
Education and skills of population	• Adult literacy • Gross secondary enrollment rate • Gross tertiary enrollment rate
Information infrastructure	• Telephones per 1,000 people • Computers per 1,000 people • Internet users per 1,000 people
Innovation system	• Royalty payments and receipts, US$ per person • Technical journal articles per million people • Patents granted to nationals by the US Patent and Trademark Office per million people

Source: The World Bank Institute, 2011b

1. Intergenerational knowledge transfer in the academic environment

Universities are *knowledge intensive organizations* due to their powerful dynamics of knowledge creation and dissemination. This is true especially for the research universities where knowledge production is more important than knowledge re-production. Moreover, they may become *learning organizations* if double-loop learning and organizational integrators are well developed (Armstrong and Foley, 2003; Bratianu, 2007; Bratianu, 2008; Ortenblad, 2001; Stewart, 2001).

Learning is a *knowledge intensive process* at both individual and organizational level. It is a strong nonlinear process that integrates several activities: perception, knowledge acquiring, dynamics of tacit and explicit knowledge, dynamics of cognitive and emotional knowledge, structuring and re-structuring through a continuous dynamics, knowledge storage, knowledge removal from the memory, and knowledge creation through a conscious effort (Bratianu, 2009; Bratianu and Orzea, 2009; Fauconnier and Turner, 2002; Pinker, 2007; Lakoff and Johnson, 1999; Nonaka and Takeuchi, 1995). Organizational intergenerational knowledge transfer is a specific process for those organizations where individuals group themselves in age layers or strata. Universities are such organizations and intergenerational knowledge transfer is a natural process.

Intergenerational knowledge transfer refers to both tacit and explicit knowledge. As Nonaka and Takeuchi (1995, p.8) emphasize, "*Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others. Subjective insights, intuitions, and hunches fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual's action and experience, as well as in the ideals, values, or emotions he or she embraces*". Tacit knowledge contains two components: a technical component that reflects the know-how of professional activities, and a cognitive component that reflects mental models, beliefs and perceptions as a result of many performed similar actions. Tacit knowledge embraces also highly subjective insights, intuitions and hunches. Leaders usually make use of these fine ingredients of tacit knowledge, being able to inspire and motivate their followers (Schein, 2004; Bass and Riggio, 2006; Northouse, 2007).

Explicit knowledge is that form of knowledge that we can transfer through language and mathematical modeling. It is implicitly contained in all kind of knowledge presented above: know-what, know-why, know-how, and know-who. Explicit knowledge is a direct result of the *externalization* and *combination* processes from the Nonaka's model of knowledge creation (Nonaka and Takeuchi, 1995). University teaching and learning are based on explicit knowledge. Actually, the largest part of all knowledge transfer in the academic environment is done using explicit knowledge. This form of knowledge is highly rational and in most cases it is a result of our metaphorical thinking (Andriessen, 2008; Bratianu and Andriessen, 2008; Lakoff and Johnson, 1999; Pinker, 2007).

Knowledge transfer in the academic environment is generated primarily from the asymmetric distribution of knowledge, and the highly nonuniformity of the organizational knowledge field. Asymmetry is almost natural in such a multilayered age field, knowledge level being higher toward the oldest layer of faculty staff. Knowledge transfer follows in a way the *law of entropy* that is knowledge is flowing from a higher level of knowledge toward a lower level of knowledge and understanding (Bratianu, 2010).

The purpose of this paper is to investigate the dynamics of intergenerational learning by using the mathematical model of the Analytic Hierarchy Process (AHP), in the Romanian

university environment (Harker and Vargas, 1987; Liang et al., 2008; Saaty, 1994). This topic is important because a university is by its own nature a nested knowledge organization, due to a continuous flow of students and of the bottom-up regeneration of the faculty staff. Knowledge creation and knowledge transfer are intertwined processes, and both of them are strongly influenced by the age scale. A university is a multilayered knowledge organization, where the inner most layers are represented by older professors who concentrate the fundamental structures of knowledge, and the outer layers are represented by students in their different learning cycles.

In addressing the problem of ageing versus intergenerational learning in the framework of education institutions this paper is going to evaluate perceptions of the academic staff toward the attitudes of *cooperation in teams*, *competition* and *innovation* -dimensions that sum highly relevant for the success of modern organizations. Opinion about attitude of cooperation in team is supposed to offer a measure for the individual's intangible temporal horizon conflict, opinion about attitude on competition - in a learning environment - is offering a measure on the asymmetric information conflict of the individual, since he has to be competitive and up to date in his field, while opinion on innovation is seen as an indicator of the salience conflict. The importance of each of these attitudes is going to be evaluated under particular alternatives and also weighted from the point of view of tradeoffs allowed in some situations. Priority vectors for each of these three attitudes and alternatives will be determined for every member of the academic staff who participated in this research through the completion of a certain specially designed survey. This will show how the main actors in the intergenerational transfer of knowledge see themselves or equivalent, what are their priorities in these three main attitudes.

2. Research design

In order to provide the reader with some background concerning the particular determinants for attitudes toward cooperation, competition and innovation in the Romanian universities, in the following it will be described in short the determinants of the promotion process that is currently at place. This is strictly connected with the flow of transfer of knowledge since if one has to fulfill some criteria it is also true the backward assertion, namely that the value of a person is the sum of the fulfilled criteria. We considered for this research all the faculties of economics and business from the academic consortium composed of the following universities: University of Bucharest, University "Al.I.Cuza" of Iasi, University "Babes-Bolyai" of Cluj-Napoca, The West University of Timisoara, and Academy of Economic Studies of Bucharest. We addressed 500 questionnaires, and we received 237 valid questionnaires from all of these universities. It is important to emphasize the fact that in this kind of mathematical analysis it is important the significance of people participating in the quantitative evaluation, and not their number. That is primarily from the main hypothesis we made that the knowledge field is asymmetric and highly nonuniform throughout the university.

The qualitative component consists in structuring the knowledge transfer field within the university and in defining the basic criteria and activities that are significant for intergenerational knowledge transfer. The whole transfer dynamics is structured into three levels: the top level is for defining the goal of this evaluation. The goal is intergenerational learning through knowledge transfer. The next lower level is for the main criteria used for

identifying the priorities of knowledge transfer attitudes. These criteria are the following: attitude toward cooperation (C_1); attitude toward competition (C_2), and attitude toward innovation (C_3). The lowest level is for defining the main activities considered in this research: activity 1 (A_1) - working for performing research grants (G); activity 2 (A_2) - working for writing books (B); activity 3 (A_3) - writing papers for scientific journals (P). The structure of this model is presented in Figure no. 1

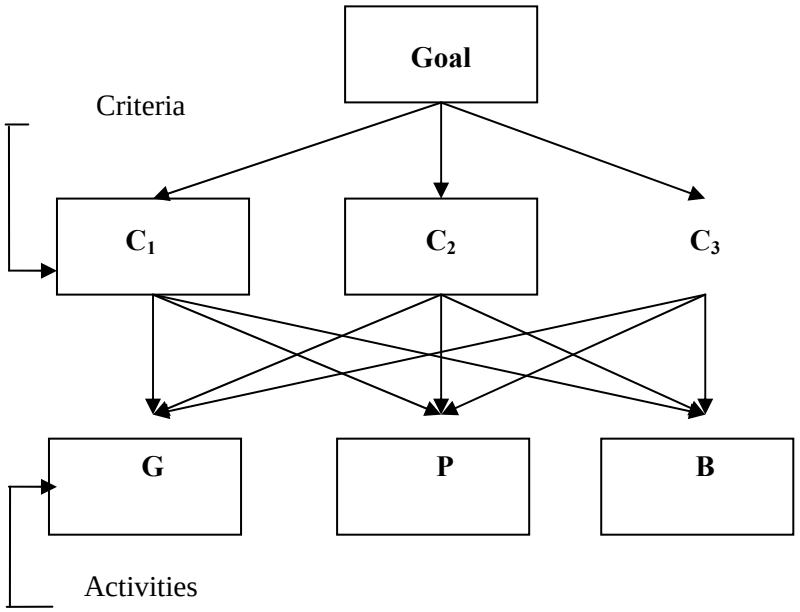

Figure no. 1: AHP structuring

3. Analytic Hierarchic Processes for determining individuals vectors of priorities for criteria and activities in the intergenerational knowledge transfer

The framework constructed for analysis includes a hierarchy with the three criteria at top: attitude toward cooperation (C_1), attitude toward competition (C_2) and attitude toward innovation (C_3) and three specific alternative activities located further down the hierarchy: grants (G), papers (P), and books (B) .The bottom level of this hierarchy contains possible options according to the relative importance of the factors involved in the three previous alternatives .The analytical process includes making judgments on pairs of elements throughout the hierarchy, one level at a time beginning at the top, based on the respondent's knowledge and according to theirs perceived relative importance of the factors involved. The most heavily weighted alternative outcome in the bottom level is the most likely one. A survey designed according with these principles was electronically distributed among the academic staff of the universities from the consortium mentioned above. In order to understand how this was processed, a short presentation of the way in which the questions were posed in this survey and processed thereafter will follow. Numerical results and interpretations will be presented in the next section.

In the following it will be presented the general form of the survey considered. We shall present also the specific type of questions we used, since they are the key for this kind of analysis. In the first page were asked general information about the position of the respondent in the university: the academic status (professor-PhD academic adviser, professor, senior lecturer, lecturer, assistant or PhD student), the Department and the affiliation to a certain Faculty. The second page was devoted to the determination of the priority vectors of the three chosen criteria in determining the quality of the knowledge transfer. This was done through the formulation of questions in comparative terms, as shown below:

1. Please, indicate on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next assertion: "In the framework of intergenerational transfer of knowledge, attitude toward cooperation (C_1) is more important than attitude toward competition (C_2)."

2. Please, indicate on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next assertion: "In the framework of intergenerational transfer of knowledge, attitude toward competition (C_2) is more important than attitude toward innovation (C_3) (like for instance developing a new economic theory, new empirical methods of estimation, proposals of international grants or promoting and implementing institutional changes)."

3. Please, indicate on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next assertion:" In the framework of intergenerational transfer of knowledge, attitude toward cooperation (C_1) is more important than attitude toward innovation (C_3)."

   The third page was devoted to the determination of the priority vectors of the alternatives (grants, papers, books) taking into consideration the criteria in the above level of hierarchy. Questions were formulated as follows:

4. With respect to the problem of inter generational transfer of knowledge, from the point of view of the attitude toward cooperation please indicate, on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next three assertions:

   4.a. Participating in research grants (G) is more important than writing scientific papers (P)

   4.b. Writing scientific papers (P) is more important than writing books or manuals(B).

   4.c. Participating in research grants (G) is more important than writing books or manuals (B)

5. With respect to the problem of inter generational transfer of knowledge, from the point of view of the attitude toward competition please indicate, on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next three assertions:

   5.a. Participating in research grants (G) is more important than writing scientific papers (P)

   5.b. Writing scientific papers (P) is more important than writing books or manuals (B).

   5.c. Participating in research grants (G) is more important than writing books (B).

6. With respect to the problem of inter generational transfer of knowledge, from the point of view of the attitude toward innovation please indicate, on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next three assertions:

   6.a. Participating in research grants (G) is more important than writing scientific papers (P)

   6.b. Writing scientific papers (P) is more important than writing books or manuals (B).

   6.c. Participating in research grants (G) is more important than writing books (B)

   Similar questions were formulated for the criterion C_2 and, respectively C_3. The forth and the last page was devoted to determining the priority vectors for the alternative schemes of equivalence regarding the alternative activities in the above level of the hierarchy.

7. With respect to research grants, please indicate, on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next assertions:

   7.a. Other professional objectives are more important than participation as a director or member in CNCSIS (national) research grants.

   7.b. Is more important to participate as a director or as a member on a CNCSIS (national research grant) than elaborating/or making efforts to become a member in international research grants.

   7.c. Other professional objectives are more important than to participate as a director or as a member on a CNCSIS (national research grant) than elaborating/or making efforts to become a member in international research grants.

8. With respect to scientific papers, please indicate, on a scale from 1 to 9 (1-indifferent, 9-full agreement) to what extent you agree with the next assertions:

   8.a It is more important to write a large number of articles publishable in national B+ journals than writing papers publishable in national ISI journals.

   8.b. It is more important to write few papers publishable in national ISI journals than taking the risk of submitting a paper to an international ISI quoted journal.

   8.c. It is more important to write a large number of articles publishable in national B+ journals than taking the risk of submitting a paper to an international ISI quoted journal.

Paired comparison judgments in the AHP are applied to pairs of homogeneous elements and summarized in a matrix of judgments. Scoring is applied to rank the three alternatives in terms of each of the three criteria considered. Matrix of judgments is determined assuming values equal to one on the main diagonal and also reversibility of the preferences-so that if C_1 is preferred to C_2 at a corresponding absolute value of 5, the C_2 will be preferred to C_1 at an absolute value of 1/5, which is 0.2.The corresponding vector of priorities is calculated in an eigenvalue formulation. The solution is obtained by raising the matrix to a sufficiently large power, then summing over the rows and normalizing to obtain the priority vector. The process is stopped when the difference between components of the priority vector obtained at the k^{th} power and at the (k+1) power is less than some predetermined small value. The vector of priorities is the derived scale associated with the matrix of comparisons (Saaty, 1994). After setting priorities for the criteria, pair wise

comparisons are also made ratings themselves to set priorities for them under each criterion and dividing each of their priorities by the largest rated intensity to get the ideal intensity. Finally, alternatives are scored by checking off their respective ratings under each criterion and summing these ratings for all criteria. This produces a ratio scale score for the alternative. The scores thus obtained of the alternatives can in the end be normalized by dividing each one by their sum.

4. Numerical results and discussion

The survey was delivered to academics from the faculties of economics and business of the consortium of the main comprehensive universities of the country, mentioned above. Finally we got 237 valid questionnaires. Once again, we underline the fact that in this type of research the significance of respondents' position is important and not the total number of respondents since the knowledge transfer field is not homogeneous. The priority vector of the criteria considered to influence the intergenerational knowledge transfer was calculated as an average on the individual vectors of priority. The weight of the Activity 1 (Grants) from the point of view of the attitude to cooperation - Criterion 1 (C_1) is calculated again as the average over the individual values in the corresponding priorities vectors. Results weighted for all the respondents are summarized in Table no. 2.

Table no. 2: Synthesis in the Distributive Mode

Distributive Mode	**C_1**	**C_2**	**C_3**
Priority vector	**0.723**	**0.150**	**0.126**
A_1	0.596	0.600	0.595
A_2	0.229	0.245	0.271
A_3	0.174	0.154	0.133

In order to establish the composite or global priorities of the alternatives considered we lay out in a matrix the local priorities of the alternatives with respect to each criterion and multiply each column of vectors by the priority of the corresponding criterion and add across each row, which results in the composite or global priority vector of the alternatives.

Corresponding results are presented in Table no. 3.

Table no. 3: Synthesis

Distributive Mode	**C_1**	**C_2**	**C_3**	**Global values**
A_1	0.4313	0.090	0.075	**0.596**
A_2	0.166	0.036	0.034	**0.237**
A_3	0.126	0.023	0.016	**0.166**

Similarly were determined vectors of priority averaged over all the respondents for the trade-off criteria with respect of grants and papers, where 1 means-other are more important, 2-is a compromise at a national level and 3 is going international with respect to the considered alternative. The results are presented in Table no. 4.

Table no. 4: Synthesis for the trade-off criteria regarding Grants-A_1 and Papers-A_2

Distributive Mode	A_1	A_2
1	0.694924	0.645866
2	0.175785	0.204687
3	0.129291	0.149447

By looking at the results in Table no. 4 we see that it also appears that option 1-doing something else but grants and papers - is most preferred. So we conclude that this also checks the fact that cooperation in the sense of something else but grants and papers are preferred channels for intergenerational knowledge transfer.

Conclusions

Intergenerational knowledge transfer is becoming an important process in the academic environment due especially to the age multilayered structure of universities, and to the asymmetric distribution of knowledge. Intergenerational knowledge transfer is a very complex process based especially on motivational driving forces that are impossible to quantify using direct methods. The complexity of this process derives also from the fact that knowledge is transferred in both its fundamental forms: tacit knowledge and explicit knowledge. The method we used in this analysis is the known Analytic Hierarchy Process developed by Saaty, and used in managerial decision making. According to this method the field of knowledge or knowledge transfer is structured in several levels, on the top being the goal of research. In this present research the goal is to find out the priorities academics have in the process of intergenerational knowledge transfer. The level of criteria has been structured in attitudes for cooperation, competition and innovation. The level of alternative activities has been structured in performing research grants, writing books and elaborating papers for scientific journals. Our research demonstrated that most academics give priority to knowledge transfer through cooperation, and within this perspective to the activity of working together for the research grants. Knowing this kind of priority, the university management can develop strategies to encourage and reward this type of activity that is an important component of the financing mechanism.

Acknowledgement

We would like to acknowledge the support received from CNCSIS-UEFISCSU through projects PN II-RU-TE-351/2010 and PN II-IDEI-1812/2008. Also, we would like to mention the “Doctoral Program and PhD Students in the education research and innovation triangle”. This Project is co-funded by European Social Fund through the Sectorial Operational Program for Human resources development 2007-2013, coordinated by the Bucharest Academy of Economic Studies.

References

1. Albu, L.L. and Dinu, V., 2009. How deep and how long could be the recession in Romania? *Amfiteatru Economic*, XI (Special Number 3), pp.675-683.
2. Allee, V., 1997. *The knowledge evolution. Expanding organizational intelligence*. Boston: Butterworth-Heinemann.
3. Armstrong, A. and Foley, P., 2003. Foundations for a learning organization: organization learning mechanisms. *The Learning Organization*, 10(2), pp.74-82.
4. Andriessen, D., 2008. Knowledge as love. How metaphors direct our efforts to manage knowledge in organizations. *Knowledge Management Research & Practice*, Issue 6, pp.5-12.
5. Andriessen, D., 2004. *Making sense of intellectual capital. Designing a method for valuation of intangibles*. Amsterdam: Elsevier.
6. Bass, B.M. and Riggio, R.E., 2006. *Transformational leadership*. 2nd edition. London: Lawrence Erlbaum Associates, Publishers.
7. Bratianu, C., 2010. A critical analysis of Nonaka's model of knowledge dynamics. *Electronic Journal of Knowledge Management*, 8(2), pp.193-200.
8. Bratianu, C., 2009. The frontier of linearity in the intellectual capital metaphor. *Electronic Journal of Knowledge Management*, 7(4), pp.415-424.
9. Bratianu, C., 2008. A dynamic structure of the organizational intellectual capital. In: M. Naaranoja, ed. 2008. *Knowledge management in organizations*. Vaasa: Vaasan Yliopisto, pp.233-243.
10. Bratianu, C., 2007. The learning paradox and the university. *Journal of Applied Quantitative Methods*, 2(4), pp.375-386.
11. Bratianu, C. and Andriessen, D., 2008. Knowledge as energy: a metaphorical analysis. In: Southampton Solent University, *9th European Conference on Knowledge Management.* Southampton, UK, 4-5 September 2008. Reading: Academic Publishing.
12. Bratianu, I., Jianu, I. and Vasilache, S., 2011. Integrators for organizational intellectual capital. *International Journal of Learning and Intellectual Capital*, 8(1), pp.5-17.
13. Bratianu, C. and Orzea, I., 2009. Emergence of the cognitive-emotional knowledge dyad. *Review of International Comparative Management*, 10(5), pp.893-902.
14. Fauconnier, G. and Turner, M., 2002. *The way we think. Conceptual blending and the mind's hidden complexities.* New York: Basic Books.
15. Geisler, E. and Wickramasinghe, N., 2009. Principles of knowledge management. Theory, practice, and cases. New York: M.E.Sharpe.
16. Harker, P.T. and Vargas, L.G., 1987. The theory of ratio scale estimation: Saaty's analytic hierarchy process. *Management Science*, 33(11), pp.1383-1403.
17. Hawryszkiewycz, I., 2010. *Knowledge management. Organizing knowledge based enterprises*. New York: Palgrave Macmillan.
18. Lakoff, G. and Johnson, M., 1999. *Philosophy in the flesh. The embodied mind and its challenge to western thought*. New York: Basic Books.
19. Liang, L. Wang, G. Hua, Z. and Zhang, B., 2008. Mapping verbal responses to numerical scales in the analytic hierarchy process. *Socio-Economic Planning Sciences*, Issue 42, pp.46-55.

20. Nonaka, I. and Takeuchi, H., 1995. *The knowledge creating company. How Japanese companies create the dynamics of innovation.* Oxford: Oxford University Press.
21. Nonaka, I. and Toyama, R., 2007. Why do firms differ? The theory of the knowledge-creating firm. In: K. Ichijo and I.Nonaka, eds. 2007. *Knowledge creation and management. New challenges for managers*. Oxford: Oxford University Press, pp.13-31.
22. Northouse, P.G., 2007. *Leadership. Theory and practice*. 4th edition. Thousand Oaks: SAGE Publications.
23. Organisation for Economic Co-operation and Development (OECD), 2011. *The knowledge-based economy*. [online] OECD. Available at: <htpp://www.oecd.org> [Accessed 21 January 2011.
24. Ortenblad, A., 2001. On differences between organizational learning and learning organization. *The Learning Organization*, 8(3), pp.125-133.
25. Pinker, S., 2007. *The stuff of thought. Language as a window into human nature.* New York: Penguin Books.
26. Saaty, T.L., 1994. Highlights and critical points in the theory and application of the Analytic Hierarchy Process. *European Journal of Operational Research*, Issue 74, pp.426-447.
27. Schein, E.H., 2004. *Organizational culture and leadership*. 3rd edition. San Francisco: Jossey-Bass.
28. Stewart, D., 2001. Reinterpreting the learning organization. *The Learning Organization*, 8(4), pp.141-152.
29. The World Bank Institute, 2011a. *K4D Knowledge for development. The World Bank Institute's program on building knowledge economies*. [online] The World Bank Institute. Available at: <http://www.worldbank.org/k4d> [Accessed 20 January 2011].
30. The World Bank Institute, 2011b. *Knowledge Assessment Methodology*. [online] The World Bank Institute. Available at: <http://www.worldbank.org/kam> [Accessed 20 January 2011].